

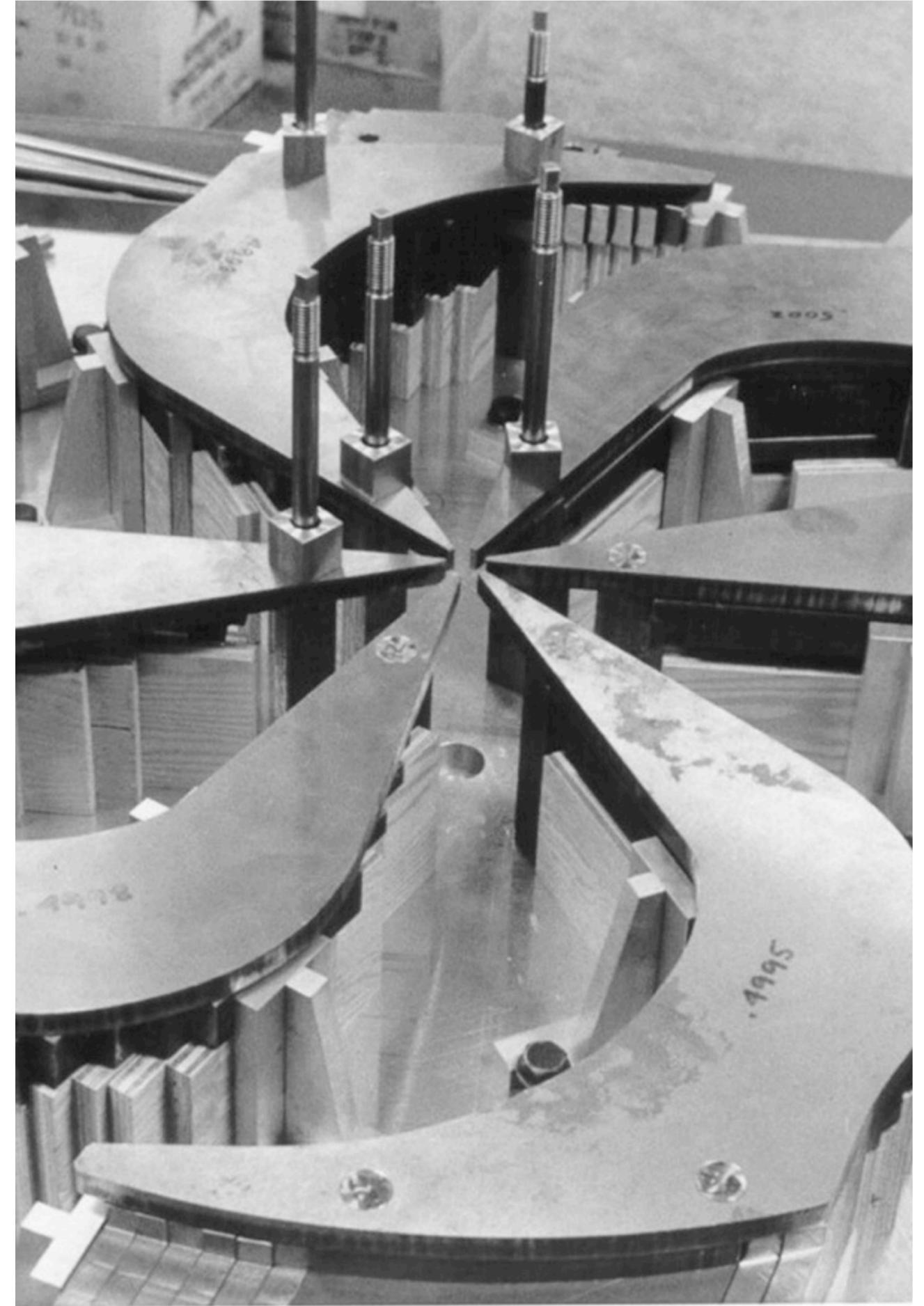


Physics Highlights from the Frontiers: Examples of International and National Status and Plans

The View from Canada

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TRIUMF Executive Director

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**Discovery,
accelerated**

The view from Canada

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- Who are the Canadian HEP community?
 - Academic community: University faculty, laboratory researchers
 - Community institutions: Institute for Particle Physics (IPP), McDonald Institute
 - Laboratories / Platforms: TRIUMF, SNOLAB, Perimeter Institute
 - Funders: NSERC, CFI, NRC, Provinces
- National plans are evergreen documents across both community and facilities
- The Canadian community has just completed its five-year long range plan for 2022-2026
 - <https://subatomicphysics.ca/>

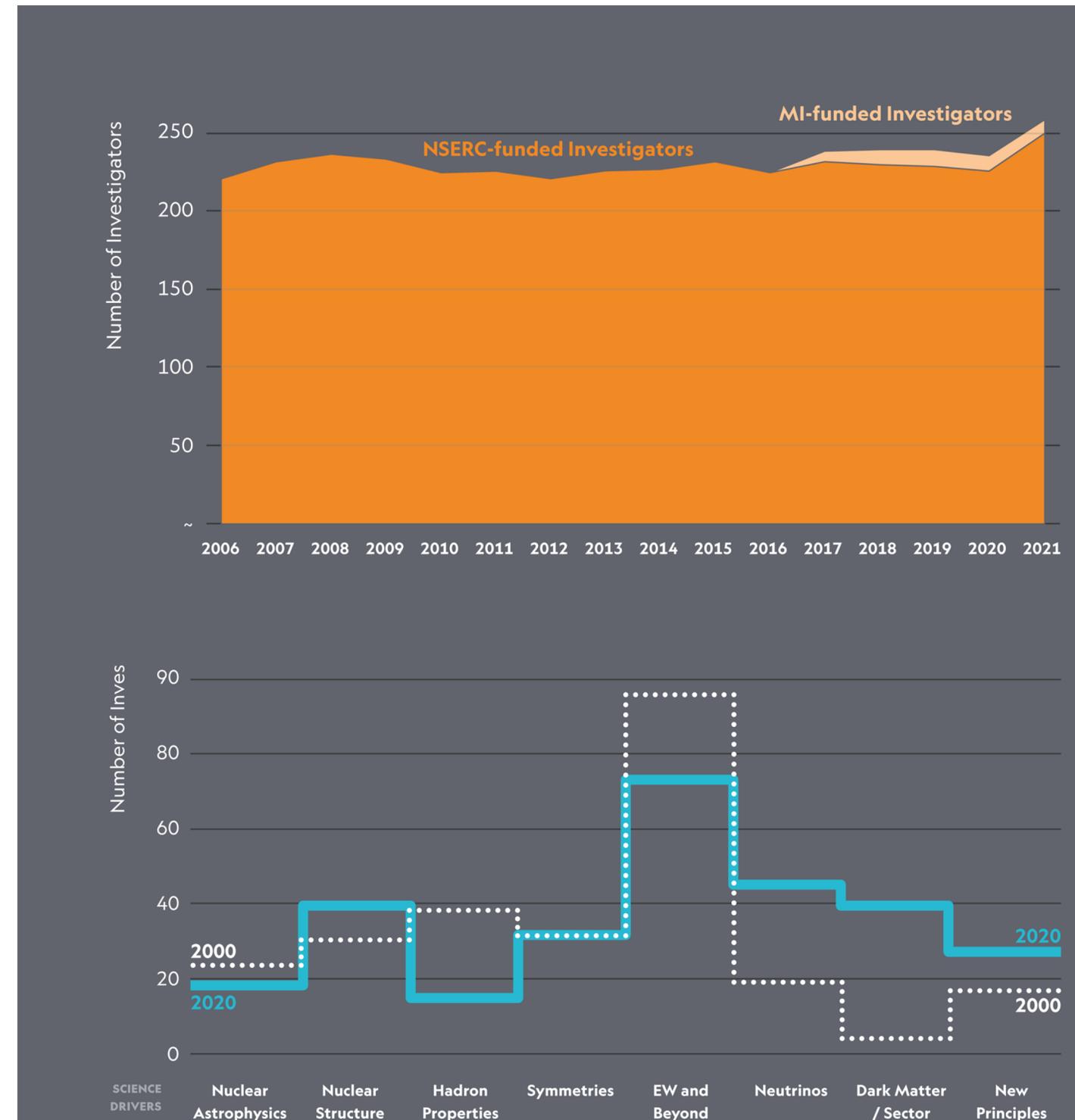
Canadian Sub-atomic Physics (SAP) Community

- Canada funding structures support ‘sub-atomic physics’ covering HEP, NP, APP
- Coast to coast academic capability
- Canada uses a faculty driven ‘bottom-up’ approach to projects and infrastructure; grant-driven approach to research



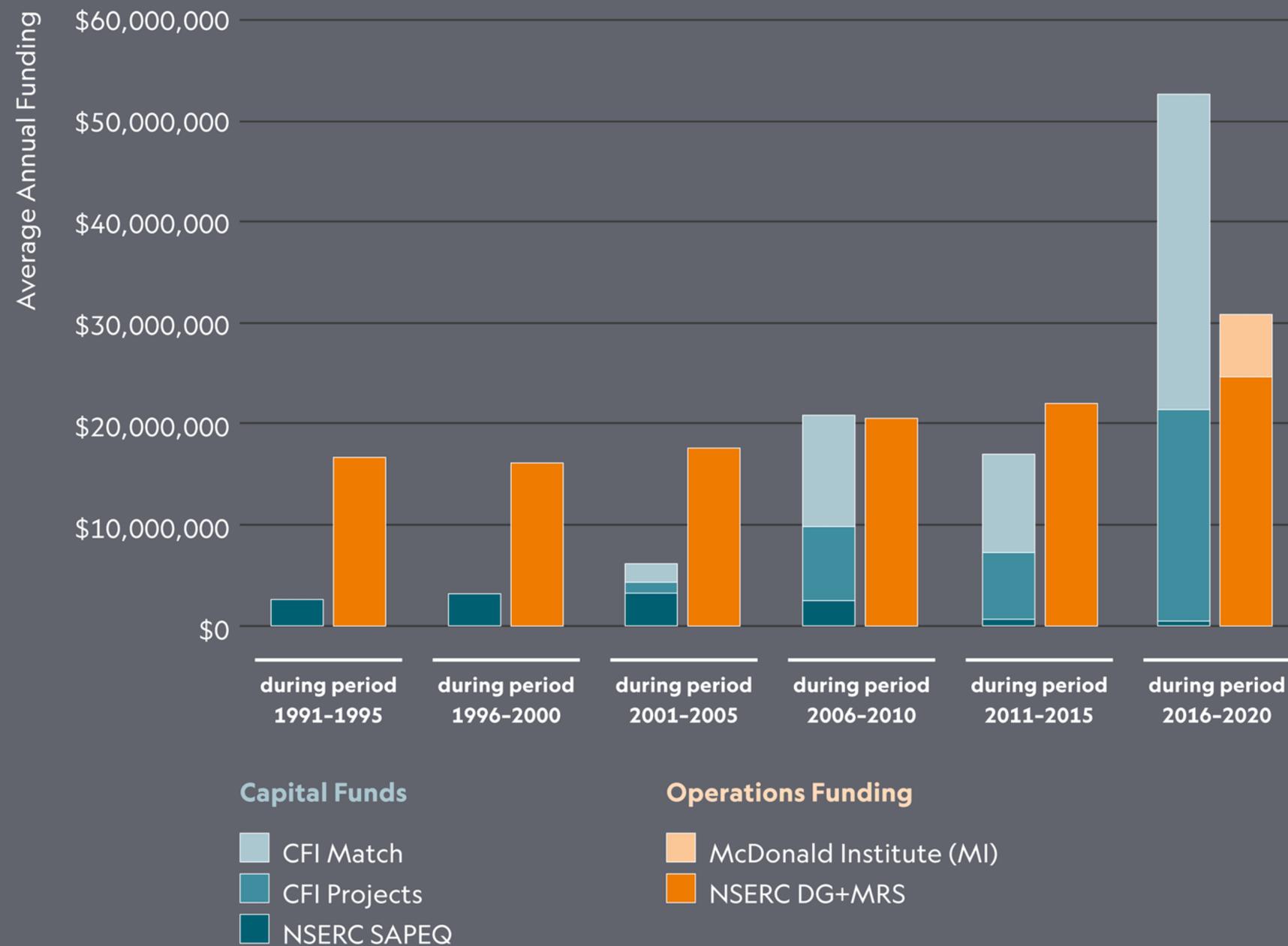
Canadian Sub-atomic Physics (SAP) Community

- Community of about 250 principal investigators
- Some transition over the last two decades away from 'EW and beyond' towards neutrino and DM studies
- Reflects growth of the SNOLAB programme



Canadian Sub-atomic Physics (SAP) Community

- Substantial growth in support to SAP programme, primarily through great success in capital requests through CFI (Canada Foundation for Innovation - still uses a bottom-up approach to resource allocation)
- McDonald Institute also provided substantial input over last five years



Canadian SAP Long Range Plan

- Aim to maximize Canadian impact in a global field, given limited resources...
- The LRP report informs funding agencies of the community's priorities for the field; however, funding agencies still hold broad peer-reviewed funding competitions.
- The report communicates to international partners (and policy makers) the Canadian plans and priorities, and resource requirements.
- An inclusive planning process that helps to strengthen and coordinate the Canadian SAP community.

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Science Drivers

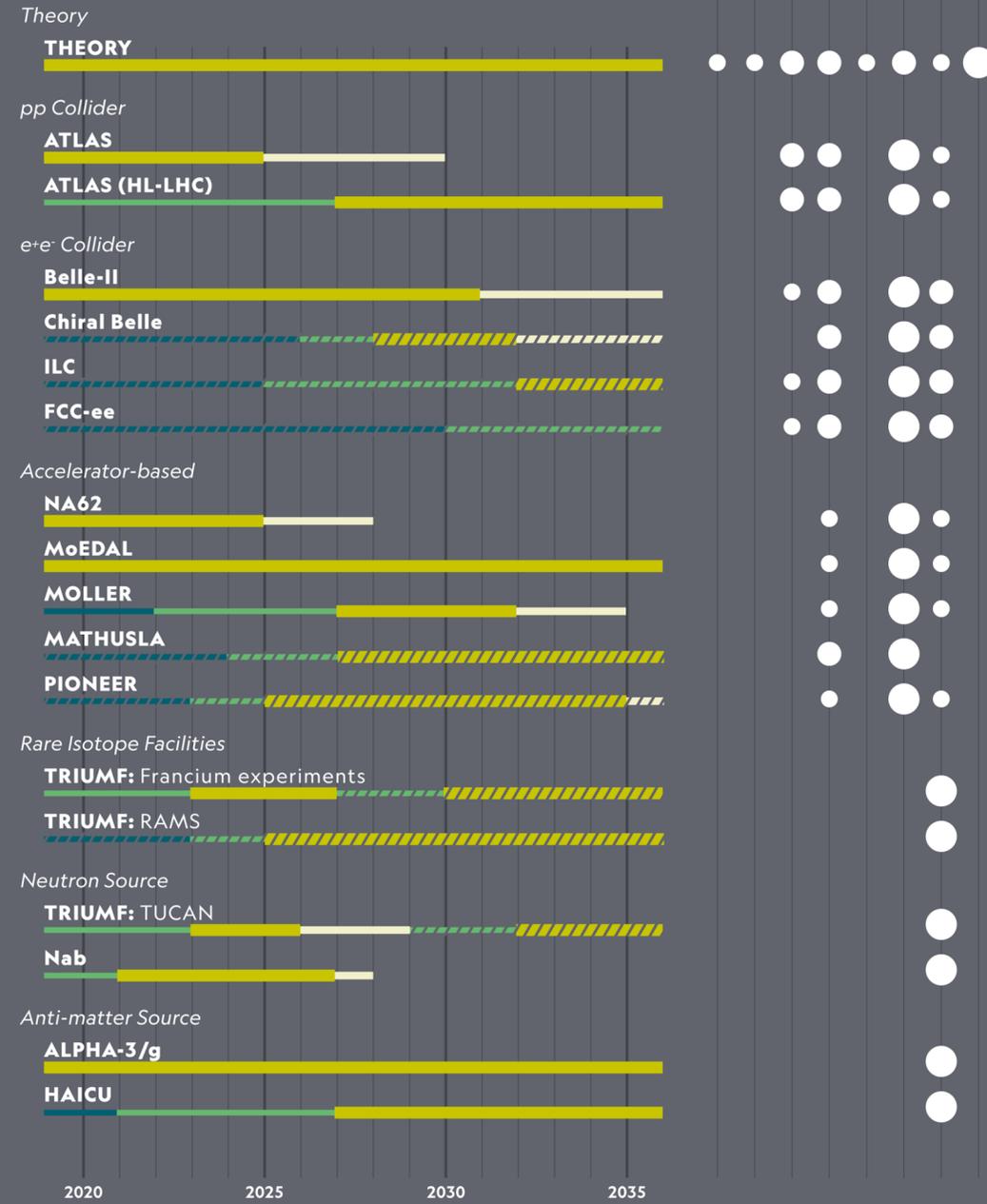
- Three broad areas of research encompass eight science drivers of the Canadian programme
 - Beyond the electroweak scale
 - Matter in the weakly coupled Universe
 - From quarks and gluons to nuclei



BEYOND THE ELECTROWEAK SCALE



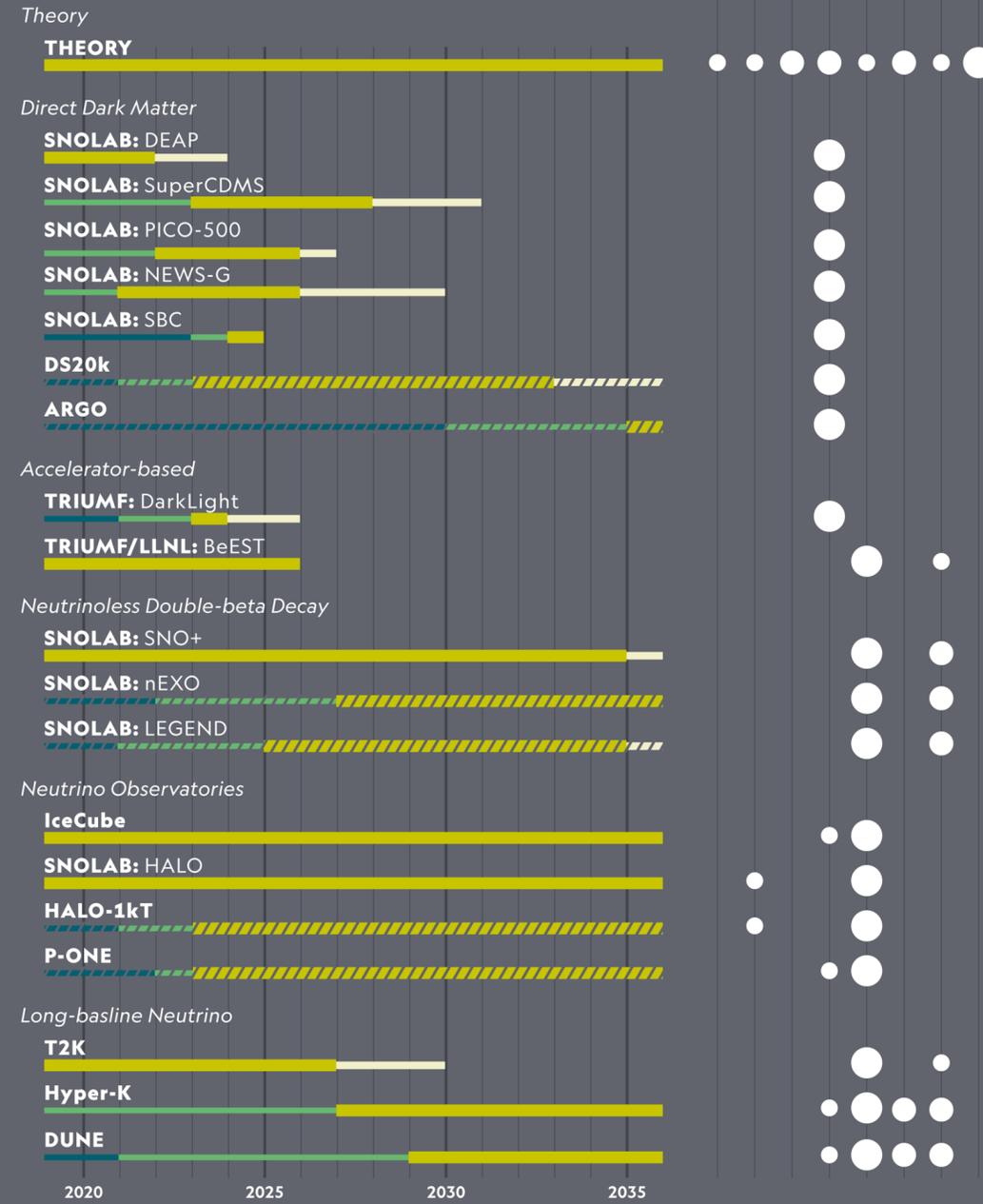
SCIENCE DRIVERS:
 Nuclear Structure
 Cosmic Nuclei
 Hadron Properties
 Dark Matter/Sectors
 Neutrinos Properties
 EW and beyond
 Symmetries
 New Principles



MATTER IN THE WEAKLY COUPLED UNIVERSE



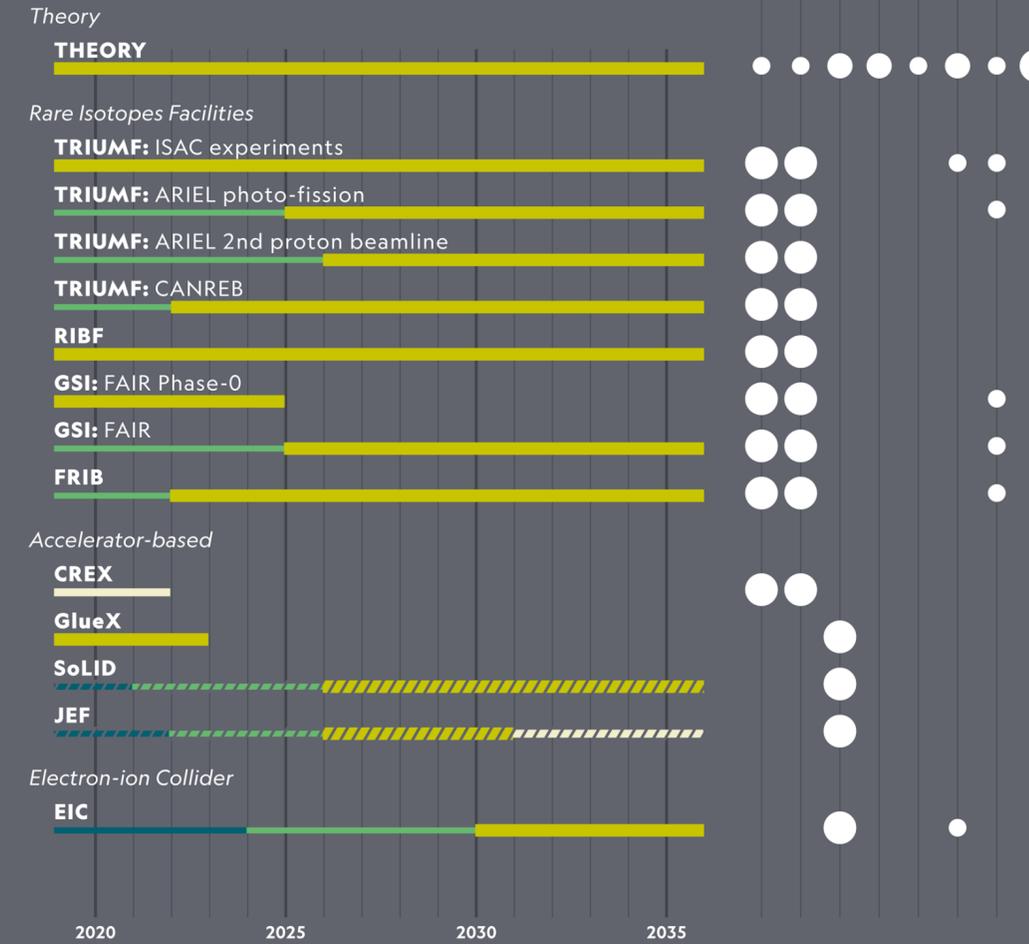
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FROM QUARKS AND GLUONS TO NUCLEI



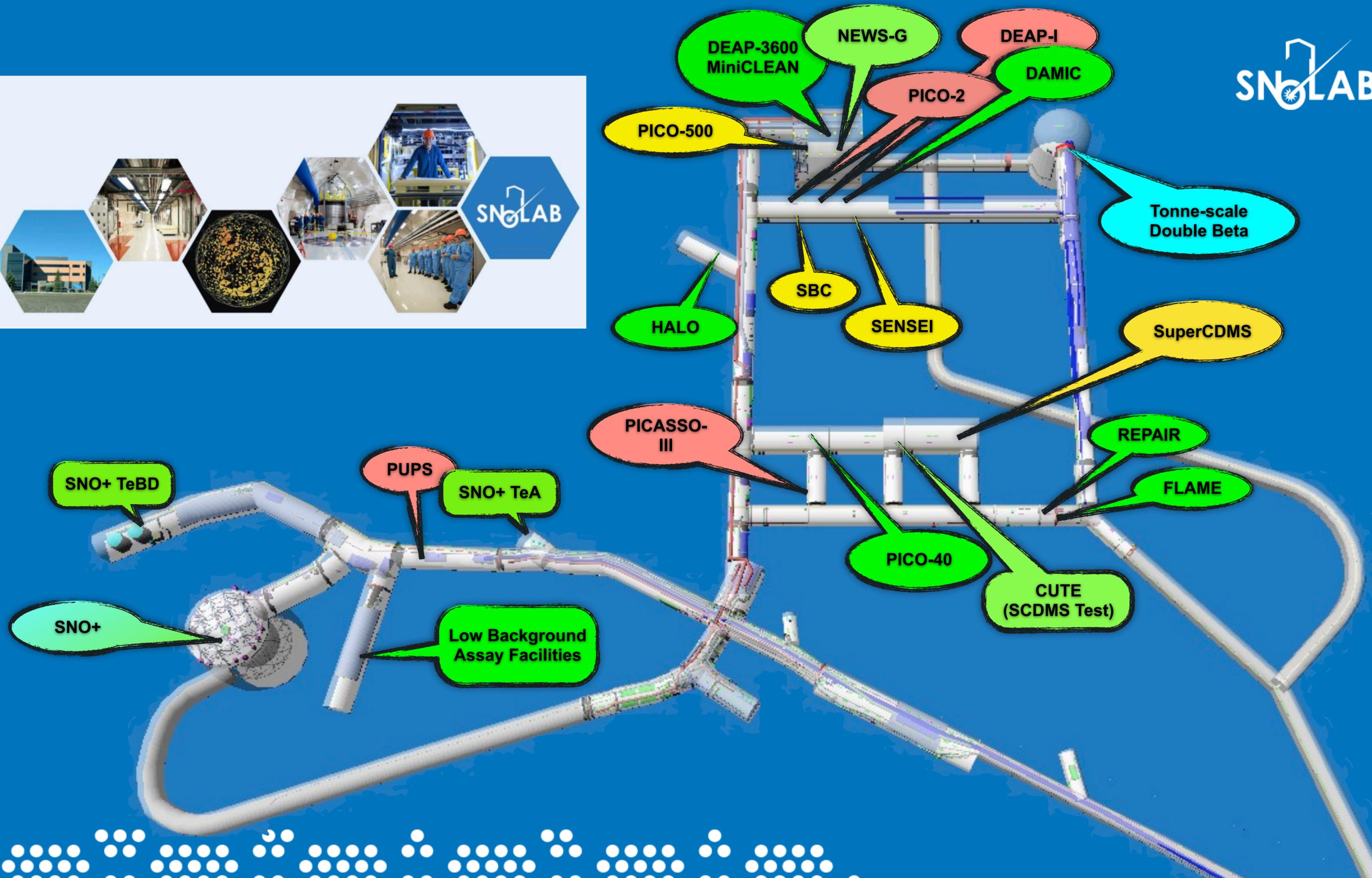
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Underpinning national capabilities

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- Canadian research programme is supported by several institutions and laboratories, all having national and international relevance
 - TRIUMF - Canada's particle accelerator centre, centred on 500MeV cyclotron and ISOL targets, additional capability being installed. Supports detector development, data management and science, medical isotopes
 - Acts as conduit for investment in international commitments (eg HL-LHC)
 - SNOLAB - Canada's deep underground research facility. 2km depth, lowest cosmic ray background in the world, broadening science programme around low background science
 - Perimeter Institute - theoretical physics institute supporting research threads across several drivers



TRIUMF's Research

Both fundamental and applied, focus on discovery-driven research



Expanding the boundaries of human knowledge



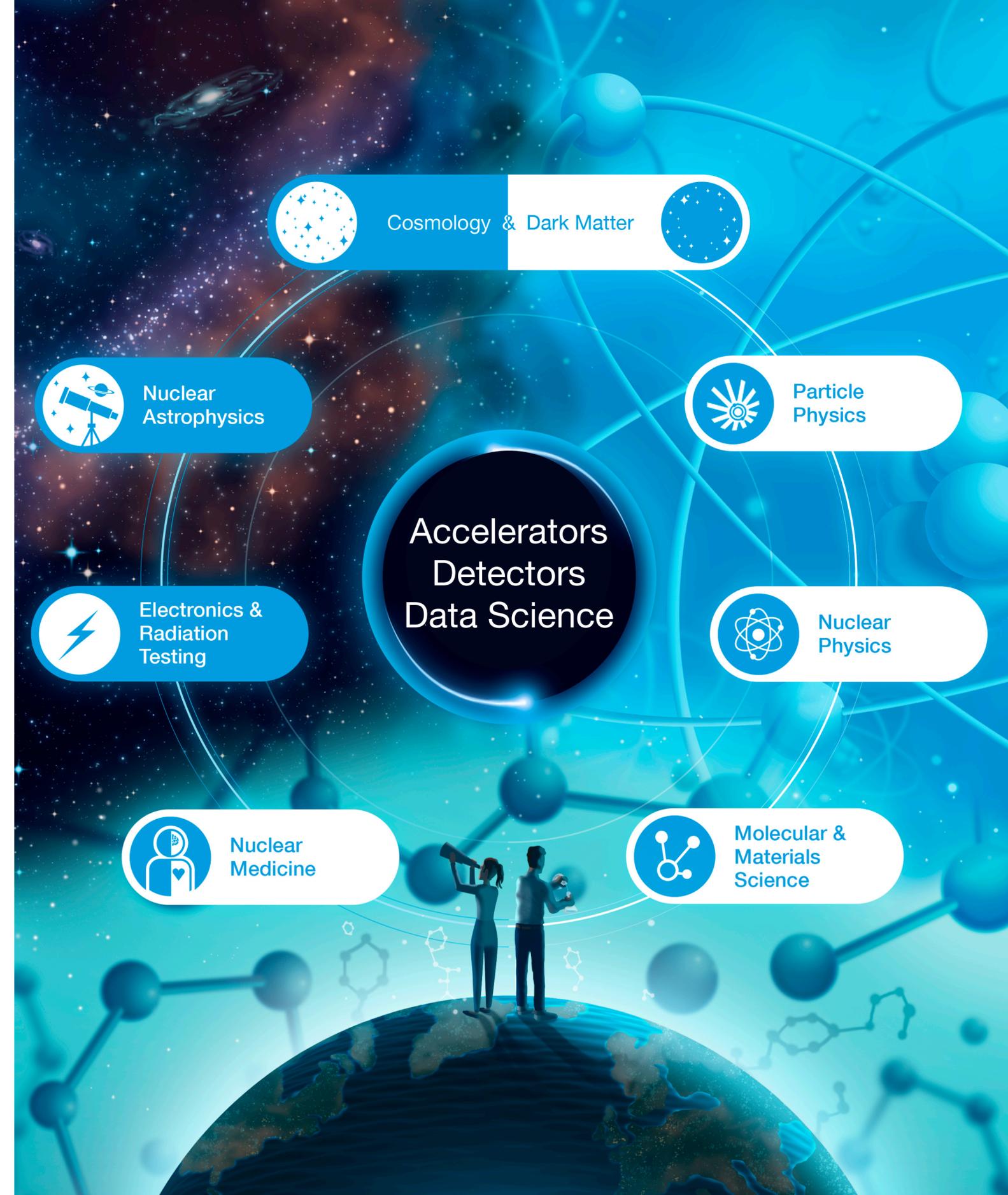
Advancing the treatment of critical diseases



Developing new technologies and innovations



Deepening our understanding of the natural world



TRIUMF accelerator complex

Primary beam driver:

Cyclotron, 520 MeV, H⁻

Produces rare isotopes, neutrons and muons!

Isotope Separator and Accelerator facility - ISAC

Isotope Separator Online (ISOL) facility

ISAC-I: Normal conducting-linac, 0.15-1.8 MeV/u

ISAC-II: Superconducting-linac, 1.5-16.5 MeV/u

Advanced Rare Isotope Laboratory - ARIEL

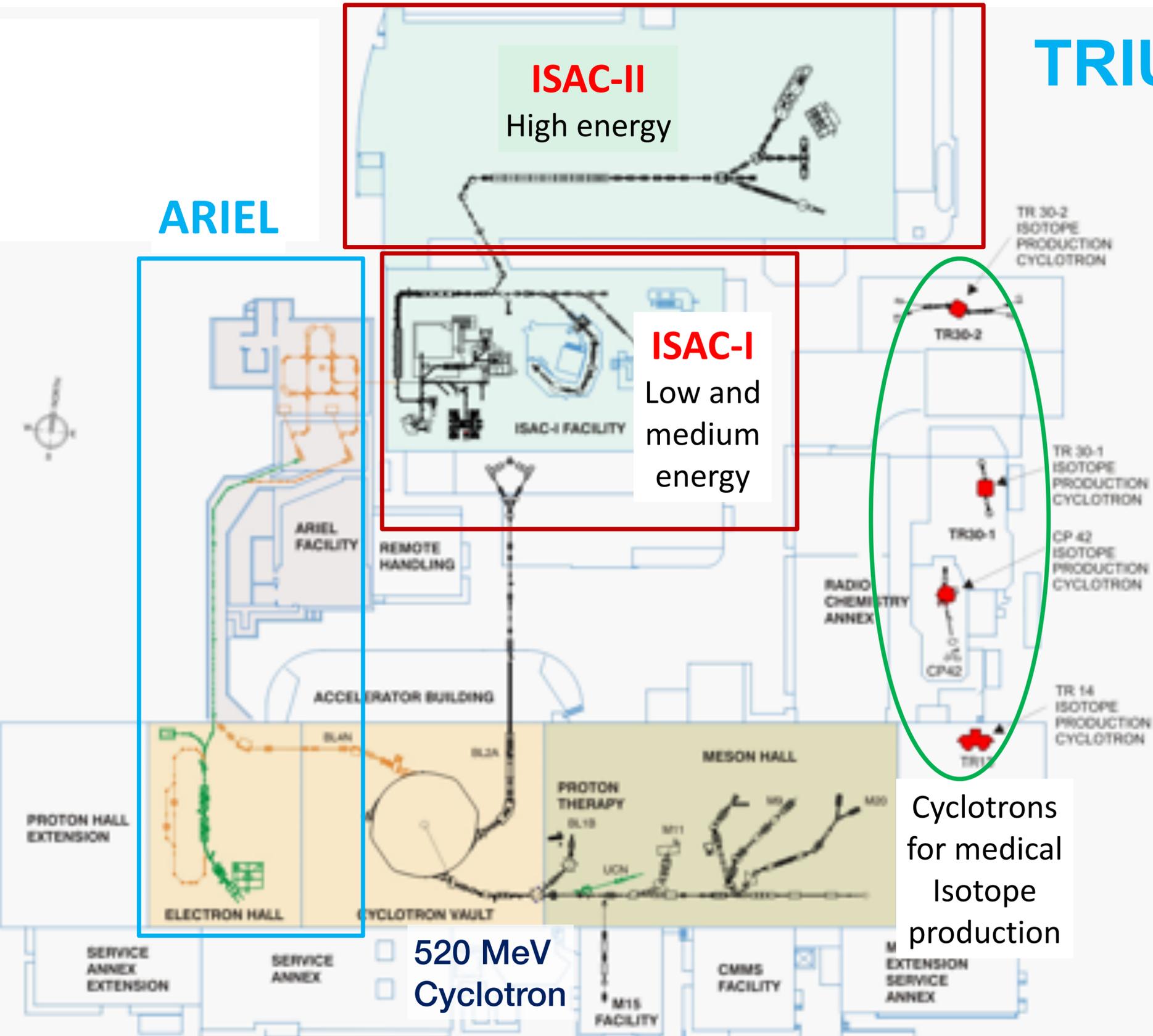
Superconducting electron linac

30 MeV, 10 mA, cw

4 Cyclotrons for medical isotope production

Cyclotrons for medical Isotope production

520 MeV Cyclotron



TRIUMF 20-year Vision

- TRIUMF has recently completed a 20-year vision process to define longer term planning requirements (TRIUMF is funded in five year cycles)
- An 18-month process engaging a broad research and stakeholder community, leading to five core themes

1. A global leader in discovery science, delivering breakthroughs that unlock the deepest mysteries of the universe:
Strengthening Canada's leadership in groundbreaking particle and nuclear physics

2. A world-class accelerator centre driving use-inspired research – from the life sciences to quantum and green technologies:
Leveraging our unique infrastructure to pursue research in Canada that will change the world

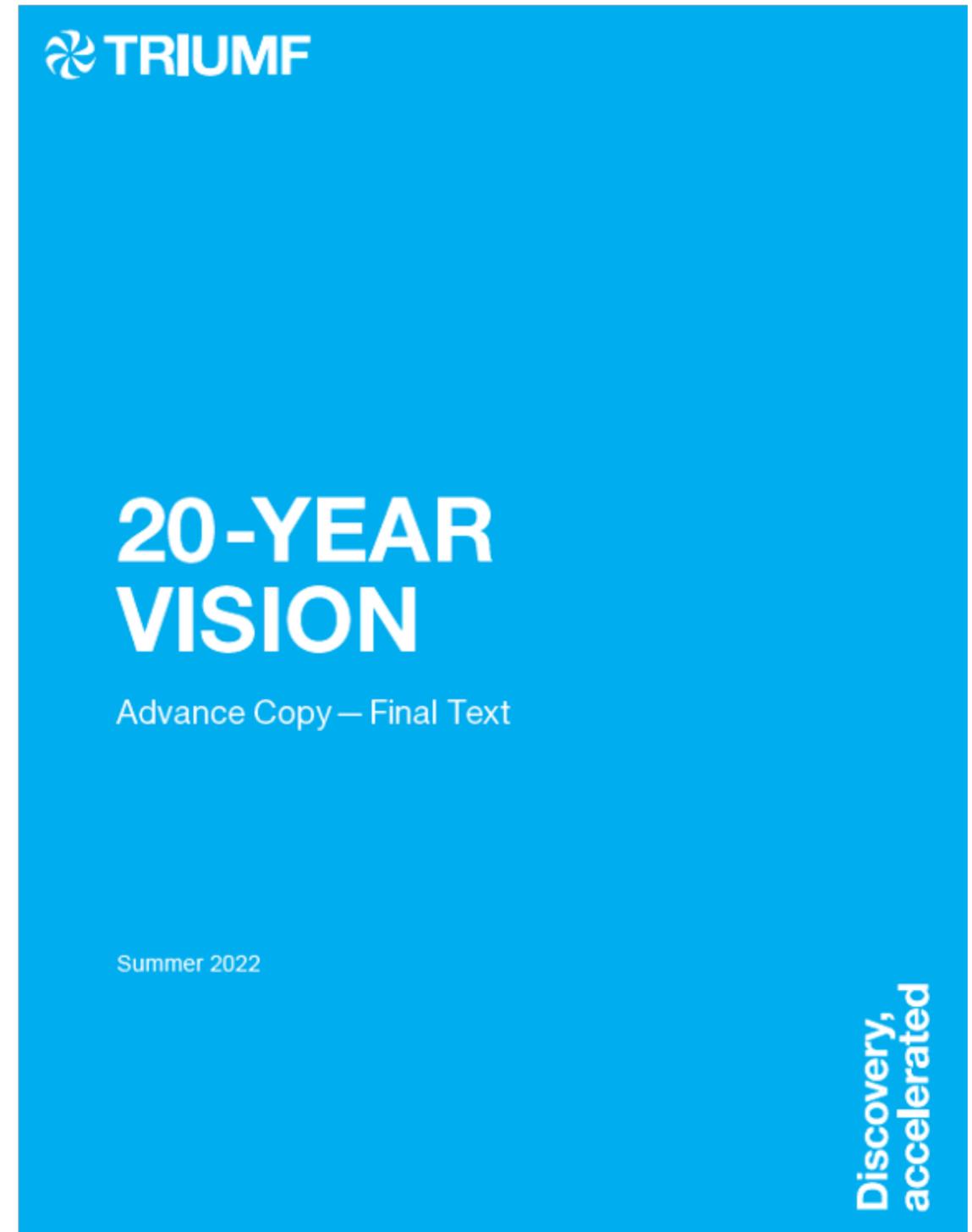
3. An inclusive multidisciplinary talent incubator, attracting and developing the best people from around the world:
Producing Canada's future science leaders and innovators

4. A leader in a flourishing national Big Science ecosystem:
Catalyzing the success and growth of Canada's network of major research facilities

5. A national innovation hub translating discovery science into health and sustainability solutions:
Responding nimbly to complex societal challenges for the benefit of Canadians

TRIUMF 20-year Vision

- The final, Board-approved text of the inaugural 20-Year Vision is available now on the TRIUMF.ca website
- This advanced copy contains the final text of the Vision; however, it does not yet include visuals and other design elements that will come with the official release.
- The full release of the 20-Year Vision is expected to be available in September 2022; both print and digital versions will be available around this window.



Canadian planning and connection to US (and international) programme

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- Canadian SAP programme is highly international
 - International collaborations across multiple continents and countries, including projects located within Canada
 - International connections between laboratories (US Labs, CERN, KEK)
 - Dialogue between agencies as appropriate and possible (given timescales and different processes adopted)
- National planning naturally incorporates the international and US connections and research drivers to ensure strong collaboration with US institutes and researchers
 - <https://subatomicphysics.ca>



Thank You!

Merci!